This has almost the appearance of a paradox, in view of the admitted fact of the extreme variability and instability of these lower forms; yet it has been generally accepted as a sound inference from the law of natural selection, and has greatly increased the difficulty that has been felt as to the enormous time required for the development of all forms of life from the supposed primordial germs. But if the facts of Archebiosis and Heterogenesis are true, and all the lower forms of life are continually being produced *de novo*, under the influence of unknown laws of development, then we may fairly conclude that, when once the earth had arrived at conditions favourable to the production of living organic matter, the process of development would be rapid, and an immense variety of low forms of animals and vegetables would soon people it. It is a fair inference, too, that if such complex organisms as Ciliated Infusoria, Rotifers, Nematoids, and even simple Acari, can be developed independently of the slowly modifying influence of natural selection, the same laws of development will continue to act a subordinate part much higher in the scale, and, by assisting natural selection in its work, may have enabled a much more rapid progress to be made.

It is very strongly argued by Dr. Bastian that the conception of an origin of living organisms at a single remote epoch in past time, and the lineal descent of all existing organisms from those primal forms, is one quite opposed to the uniformitarian and the evolutional philosophy, and in the highest degree difficult to accept. It is almost inconceivable that Bacteria, Moulds, Monads, Amœbæ, and a thousand other minute and simple organisms, should still exist so universally over the earth, and under such an infinite variety of simple forms, if all were descended from ancestors which could hardly have been more simple in the almost infinitely remote past, and which throughout all that time had been subject to those same causes of change and advance in complexity of organisation which have resulted in the varied forms of all the higher animals. Whatever laws and conditions led to the production of the earliest organisms, they are hardly likely to have been of so exceptional a nature as never to have occurred since. It does not seem probable that the very existence of life upon the earth depended on so rare and improbable a set of conditions that, having once occurred, they should never occur again in the whole period between some remote pre-Laurentian epoch and the present day. If, therefore, there is good evidence of the continued *de novo* production of lower forms of life, and of the direct transformation of these into various higher and more complex organisms, such a view will have many *a priori* considerations in its favour, and will tend to bring the whole series of life-phenomena into greater harmony with those of inorganic nature, without in any way diminishing the mysterious grandeur that surrounds them.

But if these views should be established, we shall have to form an entirely new conception of the genealogical history of the various existing organisms. We shall no longer have one "tree of life," but a vast number of such trees, all having their roots in a similar substratum of the lowest organisms, evolved at various periods of the earth's history, but differing greatly in their subsequent development. It is probable that by far the greater number of these "trees of life" have become extinct at various periods of their growth, and that all existing living things belong to portions of but a few "trees," some of which may be comparatively recent, while others may have their roots far back in the past, anterior to the earliest epochs of which geology affords us a record. But notwithstanding this diversity and separateness of origin, through the whole life-history of our globe the progress of organisation seems to have been essentially similar; which is readily explicable on the ground that living things, both as regards their origin and subsequent differentiation or development, are the immediate products of natural laws or material properties, which are probably the same now as they have ever been. Similar types of form may, therefore, again and again have arisen; and Dr. Bastian remarks, that even "the vertebrate grade of organisation *may* have been attained by ultimate branches of different trees of life." It remains to be seen how far this conception will throw light on obscure and difficult questions of biological classification, and on those facts of geological succession which are most difficult to reconcile with the usual view of all organisms whatever having originated from a single almost infinitely remote source.

It will now be seen, even from the very imperfect sketch of its subject-matter, how many questions of the highest scientific importance rise out of the facts adduced in Dr. Bastian's work. It is not too much to say that, if its main conclusions are established, it will create a revolution in organic philosophy of equal importance with that which was effected by Mr. Darwin, whose observations and most important theories will, however, remain unaffected by it. That gentleman has himself remarked that "analogy is a deceitful guide," and it is only by analogy that he extends the laws he has established for the higher animals and plants to those lower forms with which Dr. Bastian deals; and the establishment of facts proving that they come under a different category will even relieve the theory of natural selection from some of its greatest difficulties, and neutralise some of the most serious objections that have been brought against it. The whole question, however, is primarily one of facts, and, however it may be ultimately decided, every lover of science must admire the courage and energy with which Dr. Bastian has taken up an unpopular subject, the skill and patience with which he has experimented, the labour which he has bestowed in collecting the records of widely scattered and almost forgotten observations, and the logical force as well as the philosophical spirit with which he has worked out his conclusions. It is a book that cannot be ignored, and must inevitably lead to renewed discussions and repeated observations, and through these to the establishment of truth.

ALFRED R. WALLACE

NOTES

THE Lords of the Committee of Council on Education having decided to transfer the instruction in Physics, Chemistry, and Natural History from the Royal School of Mines in Jermyn Street, and the College of Chemistry in Oxford Street, to the new buildings in Exhibition Road, South Kensington, notice has been given that in future the following courses of lectures and practical laboratory instruction will be given at South Kensington at the date specified:—Chemistry by Prof. Frankland, D.C.L., F.R.S. A course of forty lectures on Inorganic Chemistry commencing 21st of October, 1872. A course of thirty lectures on Organic Chemistry commencing 13th of January, 1873. Laboratory instruction consisting of an elementary and an advanced course commencing on 1st of October. Biology by Prof. Huxley, LL.D., F.R.S., a course of eighty lectures on Biology (or Natural History, including Palæontology) with laboratory instruction, commencing the 7th of October, 1872. Physics by Prof. Frederick Guthrie. The course will consist of lectures, with laboratory work on the subject of the lectures, divided as follows:—Twelve lectures on Molecular Physics, Sound, &c., commencing 24th of February, 1873; fifteen lectures on Heat, commencing on 24th of March; fifteen lectures on Light, commencing on 12th of April; twenty lectures on Electricity and Magnetism, commencing on 19th of May. Each course will be complete in itself, and may be taken separately.

THE Trustees of the British Museum have nominated Dr. Albert Günther, F.R.S., to the post of "Assistant Keeper" in the Zoological Department, vacant by the decease of the late Mr. G. R. Gray. It need hardly be said that no fitter appointment could have been made. The vacancy occasioned by Dr. Günther's promotion is, we understand, to be filled by Mr. R. B. Sharpe, F.Z.S., late Librarian to the Zoological Society, a young and rising Ornithologist, to whom the care of the National Collections of Birds will be entrusted.

IT is with great regret that we find there is too much truth in the report that the eminent astronomer and physicist M. Delaunay, Director of the Paris Observatory, has met his death by the upsetting of a boat while in an excursion on the Coast of Normandy. We hope in a future number to give a biography of this distinguished man. His loss is an irreparable one, not only to France, but to Science throughout the world.

THE meeting of the British Association for 1873 will be held at Bradford, under the presidency of Mr. J. P. Joule, D.C.L., F.R.S. At the present meeting the Association loses, with great regret, the services of one of its permanent officers, Dr. Thomas Thomson, one of the general secretaries, who will be succeeded by Dr. Michael Foster, F.R.S.

WE have to record the death of Sir Andrew Smith, K.C.B., Director-General of the Army Medical Department from 1851 to 1858, at his residence in Alexander Square, Brompton, at the at the age of 75. Sir Andrew Smith is well and favourably known to zoologists by his "Illustrations of the Zoology of South Africa." His complete and accurate knowledge of the various tribes of Southern Africa rendered his opinion of great value to successive Governments, and it was upon his representation and advice that the district of Natal was constituted a colony.

ALTHOUGH we can quite sympathise with those feelings which induced Mr. Fawcett to bring on the Ayrton-Hooker question in the House of Commons at all hazards, we consider that it is extremely unfortunate that Sir John Lubbock's determination to postpone it till next session—when the true opinion of the House, if necessary, would have been elicited—was not carried out. As it is, Mr. Ayrton has had an opportunity of exhibiting himself in his true character, which, however, was pretty well known before; and Mr. Gladstone has had an opportunity of again learning from the public press, in no hesitating tone, what is thought of his *protégé;* but the case itself has not progressed since the time we last referred to it.

IN his annual address as president of the Pharmaceutical Society, delivered at Brighton on Tuesday morning, Mr. H. B. Brady advocated the application of a portion of the surplus funds of the Society to the encouragement of scientific training. He enunciated the very sound proposition that beyond an investment sufficient to guarantee the means of carrying out the examining and governing functions entrusted to the Society by Government, there can be no excuse for the accumulation of wealth. Constantly recurring investments represent good left undone, opportunities unaccepted. Nor in this hoarding of money instead of science is the Pharmaceutical Society true to the spirit of its founders. The Society was formed to do in a collective capacity what could not be done by individuals. "It has seemed to me," he continued, "that the most substantial aid which could be rendered in the direction alluded to would be the setting apart of a number of free benches in the Society's laboratory for students who, having passed the Major examination with credit, might desire to continue their studies. These should even be endowed with a small annual income, under certain conditions, if found necessary. The only primary stipulation should be that, possessing the requisite preliminary knowledge, the recipient should be ready to work for the advancement of pharmacy under the direction of the professor. The effect of half-a-dozen or a dozen men so trained, sent out annually from Bloomsbury Square, would be to make a British school of pharmacy the like of which has never existed; and were this carried out, the most serious difficulties in the way of provincial education would resolve themselves in a few years." Should the Pharmaceutica Society follow this admirable advice of its president, it will place itself distinctly in the van of our learned societies, and will furnish an example which might be well followed by some of the others with their too abundant invested property.

A MONUMENT in honour of Jahn, the founder of the German Turnvereine, was unveiled on Saturday on the Haasenheide, near Berlin, amid enthusiastic acclamations. When shall we, as a nation, delight to honour in a similar manner the physical benefactors of mankind?

THE French Academy has elected M. Loewy, Titular Astronomer to the National Observatory, to a seat at the Bureau de Longitudes, vacant by the death of M. Laugier.

ONE of the biennial posts for practical work at the Laboratory of Cryptogamic Botany at Pavia is now open. There is attached to it a honorarium of 700 francs.

LORD NORTHBROOK has shown his appreciation of the value of scientific research by offering a gold medal for competition by the students of the Calcutta Medical College for the best essay on the exciting causes of fever, with special reference to the calamity which has for a long time devastated the Burdwan district in India, and the measures, sanitary or other, to be adopted for their remedy and prevention.

A METEOROLOGICAL Congress is being held at Leipzig from the 14th to the 16th inst. inclusive.

THE establishment of the College of Physical Science at Newcastle-on-Tyne has been followed by the formation of a similar scheme for another of our industrial centres, Birmingham, the necessary endowments being, on this occasion, given by the munificence of a single private individual, Mr. Josiah Mason, to whom Birmingham already owes so much in various ways. Being deeply convinced (Mr. Mason says, in his trust-deed) from long and varied experience in different branches of manufacture, of the necessity for and benefit of thorough systematic scientific instruction specially adapted to the practical, mechanical, and artistic requirements of the manufactures and industrial pursuits of the Midland district, and particularly of the boroughs of Birmingham and Kidderminster, he has determined to devote a portion of his remaining property to the foundation of an institution wherein such systematic scientific instruction may be given. With this object he assigns certain freehold and leasehold property situate in various parts of the town, which may be roughly estimated worth not less than 100,000*l.*, to a body of trustees in trust for the purposes of the college. Out of the net income a sum not exceeding one-tenth may be set apart annually for providing scholarships, exhibitions, and other prizes, premiums, or gratuities, for the pupils, the remainder going to the general support of the college, the payment of professors, &c. Instruction is to be provided by means of classes in mathematics, physics, chemistry, the natural sciences (especially geology and mineralogy, with their application to mines and metallurgy), botany, zoology, physiology, the English, French, and German languages, mechanical drawing, and architecture. In addition to these means of instruction, the trustees may arrange for popular or unsystematic teaching by means of additional lectures or classes upon any subjects comprised in the regular curriculum. While no person is to be admitted to the benefit of the institution who is not for the time being wholly or principally dependent for a livelihood upon his own skill or labour, or upon the support of his parents, or upon some other person or persons, the poorer classes of the community are not to be considered as having any exclusive right to the benefit of the institution. An excellent site for the new college has already been secured in the immediate vicinity of the Birmingham Town-hall, and now that the list of trustees is completed, the college may be expected to assume form very shortly.

THE announcement, a year or two ago, of the purchase by an American of the celebrated Hay collection of Egyptian antiquities, at the time on exhibition at the Crystal Palace in London, created quite a sensation, in view of its intrinsic value and the desire which had been manifested to procure it for the British Museum. In the increasing rarity of objects of this kind, resulting from the great demand on the part of national museums throughout the world, it is believed quite unlikely that such a collection will again be brought together. Its richness in mummies, objects in bronze, marble, alabaster, &c., together with those of smaller size usually found in Egyptian tombs and elsewhere, is very great. While this collection does not embrace many statues or immense sarcophagi, it is believed to be equal to any in the completeness of its series of the smaller objects of religious and domestic Egyptian antiquity, and not inferior to the best collections of Paris, London, Berlin, or Leyden. It was purchased by Mr. Samuel A. Way, of Boston, and removed to that city, and offered to the Museum of Fine Arts, under certain conditions, which the directors did not think best to accept. At the death of Mr. Way, however, it passed into the possession of Mr. Charles Granville Way, himself an artist of merit, who has in turn offered it to the same establishment without condition other than it is to be kept in a room by itself, and to be called the Way Collection. This stipulation, we learn from *Harper's Weekly*, was gladly agreed to, and the collection accepted by the trustees, and its treasures will doubtless before long be opened to the public.

Harper's Weekly states that among some collections of specimens of natural history and ethnology lately presented by Governor W. M. F. Arny, of New Mexico, to the Smithsonian Institution, were some mastodon remains, which were submitted by Prof. Henry to Prof. Leidy for examination. These were found to indicate the existence of a very remarkable species of mastodon (*M. obscurus*), very different from the common *M. americanus*, and previously known only by a few fragments from California and a tooth found many years ago in the Miocene formation of Maryland. One peculiarity of this species consists in the existence of enamel on the tusks of the upper jaw, which does not occur in the more modern *M. americanus*. It also had tusks in the lower jaw, projecting from the prolongation of the jaw, as in the adult of the Miocene *Mastodon angustidens* of Europe, and known only in the young animal of *M. americanus*. The specimen referred to will be figured by Prof. Leidy in his forthcoming report to Dr. Hayden on the vertebrate fossils of the Western Territories.

THE second part of "Mycological Illustrations of New and Rare Fungi," edited by W. W. Saunders, F.R.S., with illustrations by Mr. Worthington Smith, will be ready in a few days. Although more than a twelvemonth has elapsed since the publication of the first part, it is hoped that in future the parts will be issued more regularly at about quarterly intervals.

WE have just received the "Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., taken at the Melbourne Observatory during March, 1872; together with Abstracts from Meteorological Observations obtained at various localities in Victoria, under the superintendence of Robert L. J. Ellery, Government Astronomer." Prefixed is a useful table of the averages and extremes of different meteorological elements at Melbourne and other localities for a number of years; and the tables which follow, showing the daily registrations for the month of March, seem sufficiently minute in detail and drawn up with great care.

THE BRITISH ASSOCIATION MEETING AT BRIGHTON

FROM Edinburgh to Brighton is a great leap, and the change is not merely one of clime and latitude. Two towns could hardly be found presenting a greater contrast. We exchange an ancient seat of learning for a modern watering place, the narrow streets and lofty houses of the Old Town for the palatial dwellings of the Steyne, Arthur's Seat for the New Chain Pier, the memory of Scott for that of the Prince Regent. So far the migration has little to recommend it; but then we have the set-off of being within easy reach of London; the British Association has, in fact, never before held its meetings so near the capital, and the present may be looked on as an experimental trial of a metropolitan meeting.

The list of officers of the meeting, and of the sections, has already been announced. The following is the diary of proceedings for each day :—

Wednesday, August 14—General Committee in the Town Hall, at 1 P.M.; Committees of Sections, at 2 P.M.; Inaugural Address by the President, in the Dome, at 8 P.M. Thursday, August 15—Committees of Sections, at 10 A.M.; Sections, at 11 A.M.; *soirée* in the Dome, Corn Exchange and Museum, at 8 P.M. Friday, August 16—Committees of Sections, at 10 A.M.; Sections, at 11 A.M.; discourse in the Dome by Prof. P. Martin Duncan, F.R.S., on the Metamorphoses of Insects, at half-past 8 P.M. Saturday, August 17—Committees of Sections, at 10 A.M.; Sections, at 11 A.M. Excursions: lecture to working men by Wm. Spottiswoode, LL.D., F.R.S., on Sunshine, Sea, and Sky, in the Dome, at 8 P.M. Monday, August 19—Committees of Sections, at 10 A.M.; Sections, at 11 A.M.; General Committee in the Town Hall, at 3 P.M.; discourse in the Dome by Prof. W. K. Clifford, on the Aims and Instruments of Scientific Thought, at half-past 8 P.M. Tuesday, August 20—Committees of Sections, at 10 A.M.; Sections, at 11 A.M.; *soirée* in the Dome, Corn Exchange and Museum, at 8 P.M. Wednesday, August 21—General Committee in the Town Hall, at 1 P.M.; concluding General Meeting in the Dome, at half-past 2 P.M. Thursday, August 22—Excursions.

The reception room will be in the New Museum and Library, Pavilion, and the following will be the rooms for meetings of Sections :—A, Mathematical and Physical Science, Albion Room; B, Chemical Science, Lecture Room, New Museum; C, Geology, Town Hall; D, Biology, Pavilion; E, Geography, Concert Hall, Middle Street; F, Economic Science and Statistics, Old Ship Assembly Rooms; G, Mechanical Science, Friends' Meeting House, Ship Street.

An Exhibition of objects of interest and works of art will be on view, during the meeting, in the Corn Exchange, New Museum and Library, and the following Excursions have been arranged :—Saturday afternoon, August 17—(1) To Glynde Station, for Glynde Place, the Chalk Pits, and Mount Caburn; to Glynde Station, for Firle Place and Beacon; (2) to Lewes, Southover, and Mount Harry, returning to Stanmer Park; (3) to Worthing, thence to Cissbury, for the excavations by Captain Oliver, and then to Findon; (4) to Bramber, then to Steyning and Wiston. Thursday, August 22—(1) To Pevensey, Hastings, and Battle Abbey, thence to the Sub-Wealden Boring, or to Norman Hurst (residence of Mr. Thomas Brassey, M.P.); (2) to Arundel, Amberley, and Parham; (3) to Chichester and Goodwood; (4) to Portsmouth, for steamer through the Solent for Alum Bay, the Needles and Freshwater Bay, Isle of Wight; to Portsmouth, for the Dockyard, Shipping, &c.; (5) to Hayward's Heath, for Paxhill, Wakehurst Place, West Hoathly Rocks, and Whiteman's Green Quarry, Cuckfield.

The Marine Aquarium, of which we shall take an opportunity of giving an account when it is in a more complete state, will of course be one of the chief objects of attrac-